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Experimental Investigation of Fluid and Particle Motion in Shear-Induced Scour[1] ZHONGFENG AN, PAUL KRUEGER, Department of Mechanical Engineering, Southern Methodist University — A submerged particle bed subjected to fluid shear exhibits particle motion (scour) induced by drag and lift forces from the fluid at sufficiently high shear rates. To investigate this behavior, a particle bed was subjected to fluid shear in a narrow rectangular channel. The flow was driven by a pump for channel Reynolds numbers in the range 3500 – 6000. The particle bed consisted of monodisperse borosilicate glass spheres at several initial particle bed heights. The velocity field of the continuous phase was measured using digital particle image velocimetry (DPIV), while the velocities of the particles were obtained by image segmentation and processing of the dispersed phase from the DPIV images. To aide in visualizing the flow, the working fluid was an aqueous solution of sodium iodide with a refractive index matched to the particles. Comparing the velocity of the two phases, a particle velocity lag was observed at higher elevations, suggesting drag was the dominant fluid force on the particles, while observations of the particle motion indicated that collisions were important near the bed surface. Effects of different flow and initial conditions will be discussed.

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